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Bagging vs Boosting

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Bagging Vs Boosting

We all use the Decision Tree Technique on day to day life to make the decision. Organizations use these supervised machine learning techniques like Decision trees to make a better decision and to generate more surplus and profit.

Ensemble methods combine different decision trees to deliver better predictive results, afterward utilizing a single decision tree. The primary principle behind the ensemble model is that a group of weak learners come together to form an active learner.

There are two techniques given below that are used to perform ensemble decision tree.

Bagging

Bagging is used when our objective is to reduce the variance of a decision tree. Here the concept is to create a few subsets of data from the training sample, which is chosen randomly with replacement. Now each collection of subset data is used to prepare their decision trees thus, we end up with an ensemble of various models. The average of all the assumptions from numerous tress is used, which is more powerful than a single decision tree.

Random Forest is an expansion over bagging. It takes one additional step to predict a random subset of data. It also makes the random selection of features rather than using all features to develop trees. When we have numerous random trees, it is called the Random Forest.

These are the following steps which are taken to implement a Random forest:

- Let us consider **X** observations **Y** features in the training data set. First, a model from the training data set is taken randomly with substitution.
- The tree is developed to the largest.
- The given steps are repeated, and prediction is given, which is based on the collection of predictions from n number of trees.

Advantages of using Random Forest technique:

- It manages a higher dimension data set very well.
- It manages missing quantities and keeps accuracy for missing data.

Disadvantages of using Random Forest technique:

Since the last prediction depends on the mean predictions from subset trees, it won't give precise value for the regression model.

Boosting:

Boosting is another ensemble procedure to make a collection of predictors. In other words, we fit consecutive trees, usually random samples, and at each step, the objective is to solve net error from the prior trees.

If a given input is misclassified by theory, then its weight is increased so that the upcoming hypothesis is more likely to classify it correctly by consolidating the entire set at last converts weak learners into better performing models.

Gradient Boosting is an expansion of the boosting procedure.

Gradient Boosting = Gradient Descent + Boosting

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Gradient Boosting =
Gradient Descent +
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It utilizes a gradient descent algorithm that can optimize any differentiable loss function. An ensemble of trees is constructed individually, and individual trees are summed successively. The next tree tries to restore the loss (It is the difference between actual and predicted values).

Advantages of using Gradient Boosting methods:

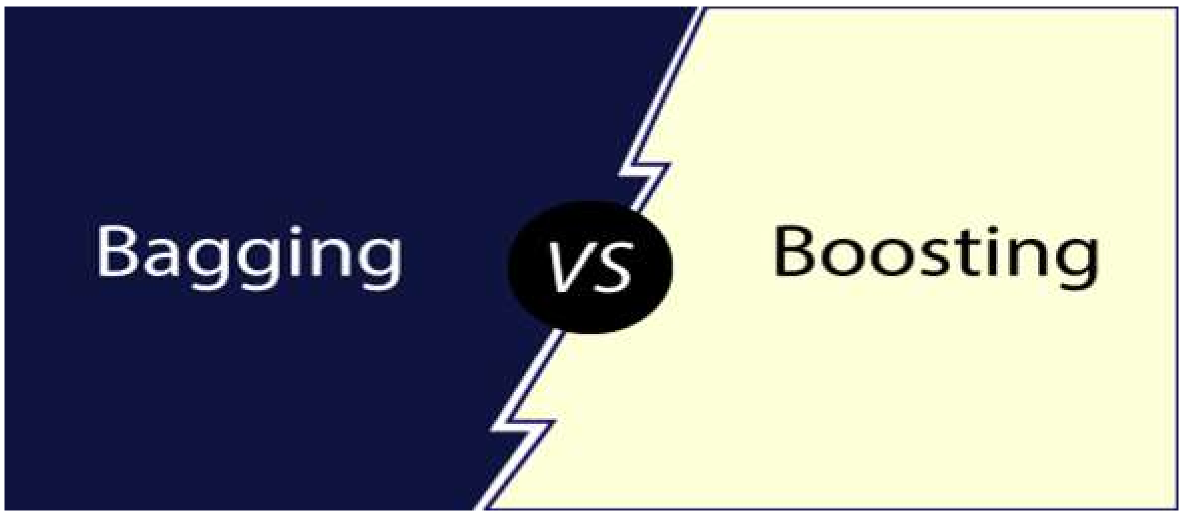
It supports different loss functions.

It works well with interactions.

Disadvantages of using a Gradient Boosting methods:

It requires cautious tuning of different hyper-parameters.

Difference between Bagging and Boosting:



Bagging	Boosting
Various training data subsets are randomly drawn with replacement from the whole training dataset.	Each new subset contains the components that were misclassified by previous models.
Bagging attempts to tackle the over-fitting issue.	Boosting tries to reduce bias.
If the classifier is unstable (high variance), then we need to apply bagging.	If the classifier is steady and straightforward (high bias), then we need to apply boosting.
Every model receives an equal weight.	Models are weighted by their performance.
Objective to decrease variance, not bias.	Objective to decrease bias, not variance.
It is the easiest way of connecting predictions that belong to the same type.	It is a way of connecting predictions that belong to the different types.
Every model is constructed independently.	New models are affected by the performance of the previously developed model.

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